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Flow Regime Transition in Trickle Bed Reactors

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ABSTRACT

In industry, trickle bed reactors – fixed beds in which gas and liquid reactants flow concurrently downward through catalyst - are often operated at gas and liquid superficial velocities near the transition boundaries between flow regimes, especially the transition between trickle to pulse flow. Previous studies have characterized flow regime transitions as sharp transitions that occur at single superficial liquid velocities for a fixed superficial gas velocity. In reality, transitions evolve gradually over a range of superficial liquid velocities. Experiments were conducted in a fixed bed with air and water flowing concurrently downward using two different packing media. The transitions were characterized using standard deviations in pressure drop measurements complimented by imaging with a high speed camera. Variable changes in the slope of standard deviation of pressure drop versus superficial liquid velocity confirm the transitions develop gradually.

KEYWORDS

trickle bed reactors, flow regime transition, pressure drop fluctuation